

Remarks

Reconsideration of the subject patent application in light of the present Amendment and Remarks is respectfully requested.

Claims 1, 3, 5-9, 11-13, 15, 16, 19-21, 23-34 are pending. Claims 32-34 have been previously withdrawn from consideration.

Applicants note that the August 4, 2003 Office Action indicates that it is responsive to the communication filed on June 10, 2003. However, no mention is made of applicants' Supplemental Amendment which was filed on June 20, 2003 and it appears that the Supplemental Amendment has not been entered. Applicants respectfully request the Examiner's clarification on this matter.

The specification has been amended at page 1 to delete the previously inserted reference to the CPA. The specification has also been amended at page 14, Table 2 to insert the unit of measurement of "g/l" for oligosaccharides, glucose, xylose, arabinose, xylitol, ethanol, and arabinitol, respectively. The amendment is made to correct the inadvertent omission of the unit of measure at the time of filing of the application, support for "g/l" is found in the specification as filed *inter alia* at page 7, line 18 and page 12, Table 1.

Claims 1, 3, 6, 8, 9, 11, 19, 23, 24, 25, 26, 30 and 31 have been amended to more particularly point out and distinctly claim applicants' invention. New claims 35-41 have been added. Applicants have amended Claims 1, 3, 6, 8, 9, 11, 19, 23, 24, 25, 26, and 30, as suggested by the Examiner in the Office Action at page 4, line 1 to page 5, line 24. Applicants respectfully note that pending claim 23 already recites "a hydrolyzed lignocellulose-containing material", therefore the Examiner's suggestion to insert "hydrolyzed" is not needed. Applicants respectfully note that the June 20, 2003 Supplemental Amendment previously removed "free hexose" and inserted "glucose" in claim 23 and inserted "xylose containing" before "prehydrolysate" in claim 31. Support for new claim 35 may be found in originally filed claim 13 and in the specification as filed *inter alia* at page 7, lines 27-28 and at page 8, line 1. Support for new claims 36-38 may be found in the specification as filed *inter alia* at page 13, lines 14-16. Support for new claims 39-41 may be in the specification as filed *inter alia* at page 12, Table 1, line 10. Support for the amendment of claim 31 to recite "50-300 g/l of xylose" may be in the

specification as filed *inter alia* at page 7, lines 15-18. No new matter has been added. Entry of this Amendment is respectfully requested. Upon entry of the amendment, Claims 1, 3, 5-9, 11-13, 15, 16, 19-21, and 23-34 and 35 will be pending.

Objection to the Specification

The disclosure has been objected to for recitation of the continued prosecution application.

In response applicants have amended page 1 to delete the previously inserted reference to the CPA. Accordingly, applicants respectfully request that the objection be withdrawn.

Rejection under 35 U.S.C. § 112, first paragraph

Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 have been rejected as containing subject matter which was not described in the specification as filed to reasonably convey that the inventors had possession of the claimed invention. Specifically, the Examiner asserts that adequate support is not found in the specification for recitation of “over about 50% of the xylose” in claims 1, 23, and 31 and lignose-containing material not hydrolyzed in claim 31.

Applicants respectfully note that the Supplemental Amendment filed on June 20, 2003, removed “over about 50%” and inserted “at least 50%”, however the latter recitation has been presently removed. The present amendments thereby render moot the aforementioned rejections. Claim 31 has been currently amended to recite “hydrolyzed” lignocellulose-containing material in the preamble. Accordingly, applicants respectfully request reconsideration and withdrawal of the rejection of Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 under 35 U.S.C. § 112, first paragraph.

Rejection under 35 U.S.C. § 112, second paragraph

Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 have been rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention.

In response, as stated above, applicants have amended Claims 1, 3, 6, 8, 9, 11, 19, 23, 24, 25, 26, and 30, as suggested by the Examiner in the Office Action at page 4, line 1 to page 5, line 24. Applicants respectfully note that pending claim 23 already recites "a hydrolyzed lignocellulose-containing material", therefore the Examiner's suggestion to insert "hydrolyzed" is not needed. Applicants respectfully note that the June 20, 2003 Supplemental Amendment previously removed "free hexose" and inserted "glucose" in claim 23 and inserted "xylose containing" before "prehydrolysate" in claim 31. Accordingly, applicants respectfully request reconsideration and withdrawal of the rejection of Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 under 35 U.S.C. § 112, second paragraph.

Rejection under 35 U.S.C. § 103(a)

Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 have been rejected as allegedly being unpatentable over Heikkila et al. (U.S. Patent 5,081,026) [hereafter "Heikkila"] in view of Chahal (U.S. Patent 5,047,332) [hereafter "Chahal"].

Further to Applicants June 10, 2003 response, applicant submit herewith evidence of common ownership of Heikkila and the present application at the time of filing of the present application to thereby remove Heikkila as a reference under 35 U.S.C. § 103.

Finnish patent application No. 900220, filed on January 15, 1990 was assigned to Suomen Xyrofin Oy; a copy of the Assignment is attached hereto. The subject application is a continuation of U.S. Patent No. U.S. Serial No. 07/910,133 filed July 14, 1993, now abandoned, which is a United States national stage application under 35 U.S.C. 371 of PCT International Application PCT/FI/00011, filed January 10, 1991, which claims priority to Finnish Patent Application No. 900220.

Heikkila et al. patent application, U.S. Serial No. 297,791, filed January 17, 1989 was assigned to Suomen Xyrofin Oy; a copy of the Assignment is attached hereto. Heikkila et al. patent application, U.S. Serial No. 611,383, filed November 2, 1990, was a continuation of U.S. Serial No. 297,791 and issued as U.S. Patent No. 5,081,026 ('026). Accordingly, both the Heikkila '026 patent and subject application at

the time of filing of the Finnish priority application, were both assigned to the same entity, Suomen Xyrofin Oy.

Suomen Xyrofin Oy changed its company name to Xyrofin Oy on October 23, 1991, which is shown in an "Extract From the Trade Register" of the National Board of Patents and Registration of Finland at page 2; the Extract is attached hereto. The subject application was assigned to Xyrofin Oy; a copy of the Assignment is attached hereto.

Accordingly, applicants respectfully request reconsideration and withdrawal of the Heikkila et al. '026 patent as a reference under 35 U.S.C. § 103 and withdrawal of the rejection of Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23.

Rejection under the Judicially Created Doctrine of Obviousness-Type Double Patenting

Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 have been rejected as allegedly being unpatentable over claims 1-28 of Heikkila et al. (U.S. Patent 5,081,026) [hereafter "Heikkila"] in view of Chahal (U.S. Patent 5,047,332) [hereafter "Chahal"]. The Examiner asserts that it would have been obvious to produce ethanol in the claimed process of the patent [Heikkila] to obtain ethanol for use as suggested by Chahal by hydrolyzing cellulose in the starting material with cellulase to obtain glucose that can be fermented to ethanol.

Applicants respectfully traverse the obviousness-type double patenting rejection and maintain that Claims 1, 3, 5-9, 11-13, 15, 16, 19-21 and 23-31 are not obvious over claims 1-28 of Heikkila in view of Chahal.

Initially, applicants respectfully note that claims 1-28 of Heikkila do not recite the production of xylitol and ethanol from a hydrolyzed lignocellulose-containing material comprising the step of recovering the resulting ethanol by distillation and then recovering xylitol by chromatographic separation, as recited in independent claims 1, 23 and 31.

Secondly, Chahal's multi-component process, as shown in Figure 1, fractionates a biomass into fractions of cellulose, lignin and hemicellulose, wherein

the cellulose and hemicellulose are converted into protein-rich animal feed and part of the cellulose is converted into glucose. Cellulose is hydrolysed by a cellulase made by *Trichoderma reesei* QMY-1 (NRRL 18760) to produce glucose, which is then fermented with yeasts or bacteria to produce ethanol. One portion of the hemicellulose is used to produce inocula of microorganisms and another portion of the hemicellulose is used for fermentation with fungi to produce protein-rich animal feed. Since Chahal's process produces protein-rich animal feed and ethanol, one of skill would not be motivated to combine Chahal with Heikkila to arrive at the claimed method of simultaneously producing ethanol and xylitol.

The Examiner focuses on Chahal's hydrolysis of cellulose with cellulase to obtain glucose which can be fermented into ethanol and combines this part of Chahal's process with Heikkila's process to conclude that such a combination would render obvious the production of ethanol, as claimed. Applicants respectfully maintain that this focus is misplaced, as the subject specification describes that it is known to produce ethanol from cellulose and hemicellulose (See, Specification, page 3, lines 14-23) Further, the claimed process provides a starting material comprising both xylose and glucose. Therefore, no nexus between Chahal's hydrolysis of cellulose to produce glucose and fermentation of the glucose to produce ethanol and Heikkila's methods of producing xylitol by fermenting a hydrolyzate of xylitol and hexoses is provided. Ethanol is removed by evaporation or distillation by Heikkila and the xylitol is recovered.

Chahal does not teach or suggest simultaneously producing xylitol and ethanol by fermenting hydrolyzed starting lignocellulose-containing material with a yeast strain which is capable of converting xylose to xylitol and glucose to ethanol to form a fermented product comprising xylitol, ethanol and yeast and recovering the ethanol and xylitol, as claimed. (Emphases added) Rather, Chahal describes the co-production of protein-rich animal feed and ethanol. Therefore, one of skill would not be motivated to combine Chahal with Heikkila to simultaneously produce xylitol and ethanol. Nor would one of skill have a reasonable expectation of success at arriving at the claimed methods based on the addition of Chahal to Heikkila.

Specifically, Chahal describes anaerobic fermentation of [glucose] hydrolysate

in a known manner with yeasts (*Saccharomyces* spp. or *Kluyveromyces* spp.) or bacteria (*Zymomonas* spp.) to produce ethanol. (See, Col. 5, lines 25-29). Chahal does not teach or suggest any of the yeast used in the claimed methods. Further, Chahal's multi-component process also does not teach or suggest that any of the aforementioned yeast or bacteria may be used to simultaneously convert xylose to xylitol and glucose to ethanol and recovery of both xylitol and ethanol. Therefore, Chahal's Example II of the production of ethanol *without any xylitol*, even when combined with Heikkila, would not teach or suggest the claimed invention, since *neither* the same yeast of the present claims are suggested by Chahal, *nor* are the same results achieved. Further, there is no suggestion by Chahal that the yeasts or bacteria described therein maybe used alone and/or together with the yeasts of the present invention to arrive at production of xylitol and ethanol and recovery of both. Therefore, even if Chahal is combined with Heikkila, the combination at most, provides two different fermentation processes using different microorganisms. One of skill in the art, would therefore, not be motivated by Chahal to combine its teachings with Heikkila to arrive at the claimed invention. Nor would such a combination provide a reasonable expectation of success at arriving at the claimed methods.

Chahal also describes inoculation of a portion of hemicellulose with *Trichoderma reesei* QMY-1 (NRRL 18760) to grow an inoculum which can be combined with cellulose to produce a cellulase enzyme which will be used for the cellulose hydrolysis *to produce glucose* (See, Col. 5, lines 34-40). (Emphasis added) Chahal does not suggest that the aforementioned microorganism *also* ferments xylose to xylitol. The *Trichoderma reesei*, used by Chahal is a fungi is not a yeast. Therefore, one of skill would not be motivated *to use the yeast of the claimed methods* to arrive at the claimed invention based on the teaching of Chahal. As such, one of skill in the art, would not be motivated by Chahal to combine its teachings with Heikkila to arrive at the claimed method which uses a yeast strain which is capable of both converting xylose to xylitol and converting glucose to ethanol. Neither would such a combination provide a reasonable expectation of success at arriving at the claimed methods.

Accordingly, applicants respectfully request reconsideration and withdrawal of the obviousness-type double patenting rejection of Claims 1, 3, 5-9, 11-13, 15, 16, 19-

21 and 23-31 over claims 1-28 of Heikkila in view of Chahal.

In view of the preceding, it is respectfully submitted that the subject application is now in condition for allowance. A Notice of Allowance is earnestly solicited. If Primary Examiner has any questions or wishes to discuss this matter further, he is kindly asked to call the undersigned attorney.

Respectfully submitted,

Date January 5, 2004

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